

BRIEF NOTES TOWARD THE LIFE HISTORY OF  
*PELOCORIS FEMORATA* Pal. B. WITH A  
FEW REMARKS ON HABITS.

BY J. R. DE LA TORRE BUENO.

The aquatic Rhynchota present an attractive and fallow field to the entomologist, and afford him an opportunity to tread in ways never before explored. Of all the faunas, that of Europe is comparatively best known and most studied; yet even in that, although classification, the skeleton of the science, is more advanced than with us in the United States, but little is known of the life-histories of even the commonest species, beyond, perhaps, a description of the ovum; or a surmise as to the number of instars, deduced from analogy; or, again, a description of one or two nymphal stages. The greater part of this work, as I have noted elsewhere, refers principally to *Notonecta* and *Corixa*. To this scanty store of information it is now my privilege to add these notes on *Pelocoris* in the hope that they will fill up a gap in our knowledge of American insects.

*Pelocoris femorata* Pal. B. is to be found, according to Professor Uhler's "Check List," in the United States. However, no mention is made of the insect in the local lists of Osborn, Gillette and Baker, or Van Duzee. Professor Smith, on the other hand, mentions it in his New Jersey List and Lugger in his "Bugs of Minnesota," while Uhler gives it as found in California in his paper on "The Hemiptera of Lower California." In this vicinity, I have found it abundant, and my collection contains one specimen each from Rhode Island, Pennsylvania and Maryland. Uhler, in the second paper mentioned, states that it is widely distributed in the United States.

Wherever I have found it I have taken it in large numbers. *Pelocoris* is a vigorous swimmer. In the spring of the year the bugs may be seen freely swimming among the growing aquatic vegetation. When alarmed, they hide in the soft ooze at the bottom or among the weeds, getting close in to the axils of the leaves. Occasionally, they may be seen in the hollows of lily-pads, apparently sleeping in the sun. I have taken the bug in this condition, quite dry and seemingly torpid. At times they come to the surface, where they hang abdomen or dorsum up, indifferently, the tip of the abdomen breaking the surface

film. This is done, as is usual with the aquatic Hemiptera, for the purpose of renewing the air coating the abdomen and stored under the hemelytra. In renewing its supply of air, *Pelocoris* sometimes appears to protrude the terminal abdominal segments to break through the surface. It also separates the tip of the abdomen and the hemelytra in such a manner that a comparatively large aperture is formed at the surface. While under water the insect may be seen to pass its swimming legs through the abdominal air-coating a few times every now and then, somewhat as does *Corixa* and possibly for the same purpose of renewing the oxygen. Some of the individuals from which I have made these notes, when taken, had a fungoid growth on the hemelytra and thorax. This, however, does not seem to be in any way injurious. I have one individual in this condition in my aquarium, where it has been for the last four months. When in captivity, I have fed them on flies, one apiece every day, which appears to have been enough. Sometimes three or four will fasten on one insect, feeding together very amicably. *Pelocoris* is fiercely predaceous, and its salivary secretion must be highly toxic. In a thoughtless moment, I put a *Belostoma* (*Zaitha*) nymph in the aquarium with these insects. It was no sooner in the water than it was seized, and although I forcibly rescued it immediately, it died in about a minute.

According to De Geer, the European *Ilyocoris* (*Naucoris*) *cimicoides* Linné, flies by night, and it may safely be assumed that our *Pelocoris* does the same, although I have never seen it. At any rate, its wings are well developed and apparently powerful.

In common with Belostomidæ, Nepidæ and Corixidæ, *Pelocoris* is at times found with water mites fastened to it, especially under the hemelytra, or at the suture dividing the thorax and prothorax. \*

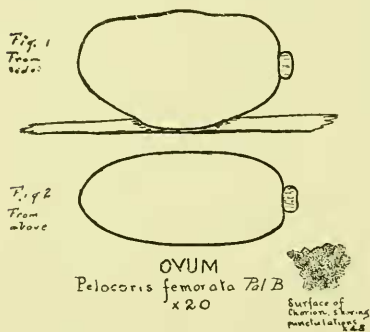
*Pelocoris femorata* overwinters in the adult form, and survives till the following autumn. Oviposition begins in the spring, just how early I am unable to say, and continues at least till the middle of summer, when the insect begins to come to maturity. I have taken

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\* I have very rarely found this to be the case with *Notonecta*, although I have taken *Notonecta irrorata* Uhl. with mites under the wings. In general, the waterbugs are attacked in about this order: Nepidæ, Belostomidæ, Corixidæ, Naucoridæ and Notonectidæ, the last named being the least susceptible. From the facts that this is also the order of their activity; that *Ranatra*, a most sluggish insect, is the most heavily parasitized; and that *Notonecta*, which is constantly on the move, the least, it seems fair to infer that the water mite selects for its attacks those insects that disturb it least.

ova as early as May 16, and found the recently transformed adults on August 16, giving a period of development of over 12 weeks. However, as the ova and adults were found in different localities, this may explain the discrepancy, as the period in question has not been borne out by aquarium experiments, which gave about 77 days for development from the ovum to the adult. There are five nymphal instars which, with the embryonic stage and the adult, gives seven stages of growth altogether, as shown by aquarium breeding. The number of instars also holds good in nature. On the same day and at the same place, I have taken *Pelocoris* in all stages, except the ovum and the first nymphal instar.

The following life-history has been worked out by me in my aquaria, and is subject to revision, because of the small number of individuals observed. The young *Pelocoris* were fed on flies, on which they thrive.



On June 6 of this year (1903), I took a number of overwintering *Pelocoris*, which I put in an aquarium on the following day. On looking at them a day or two later, I noticed that the water-

plant in the aquarium had some ova on it. I removed these on the 8th, and did the same on the 9th, setting apart the two lots, 73 ova in all, for observation.

*Color*.—Translucent pearly white when deposited, growing darker as development progresses. *Markings*: Surface minutely punctulated in lines, punctures set close together, giving the appearance of meandering striations. As the time for emergence approaches the character of the markings changes. The chorion is still punctulated, but at the same time engraved in distinct hexagons produced by the punctulations. *Shape*: From above, imperfectly oval; from side, somewhat flattened above, with a gradual rise toward the middle. The cephalic end is more rounded than the caudal, descending to the line of attachment with a shorter curve. This curve is somewhat depressed at the extremity of the ovum, from which depression arises the micropylar boss. (See Figs. 1 and 2.) The form changes during incubation and just previous to emergence the ovum is larger and rounder than when first deposited. *Size*: Longitude, 1.4 mm.; latitude, .6 mm.; altitude, .7 mm.

While I have not been so fortunate as to witness oviposition by this insect, M. Régimbart, in his classic paper on "Observations sur la

Ponte du *Dytiscus marginalis* et quelques autres Insectes aquatiques," read December 9, 1874, before the Société Entomologique de France, describes the act in *Ilyocoris cimicoides*, in connection with the same function in *Notonecta glauca*. His description follows :

"These insects (*Ilyocoris cimicoides* and *Notonecta glauca*) attach themselves firmly by means of their anterior and intermediate pedes to the stems of plants, holding the head high in the same way as *Dytiscus*, making peculiar motions with the swimming legs; the rostrum is sunk deeply into the plant for support, and an incision is made with the ovipositor. The motion of this apparatus, which is more complicated than that of *Dytiscus*, can scarcely be properly examined, as little can be gathered from the outside; it can be guessed at from the abdominal movements from front to back and from back to front. The incision calls for about one minute's labor on the part of these insects; it is not very deep, only about 2 or 3 mm. long, and the ovum is only about three fourths of its length enclosed by it, being set obliquely, so that one of its ends is nearly quite out. It should be noted that the free portion corresponds to the cephalic extremity of the embryo."

It may be assumed, in default of direct observation on *Pelocoris*, that the mechanism of oviposition is substantially as described, and it is to be hoped that some observer may be so fortunate as to be able to describe the process in detail. However, as regards the attachment of the ovum, *Pelocoris femorata* seems to differ from *Ilyocoris cimicoides*, as far as my observation has gone. Out of about 100 ova examined by me, some found in natural conditions, others deposited in aquaria, none has been met buried in the plant tissue to any extent. The majority have been found attached axially to the stems or leaves of *Ceratophyllum*, and secured to them by a glue in which the ovum is set and which surrounds the slender stem or leaf to a variable extent. The adhesion is not very firm, however, and the ova are readily detached.

As development advances, the eyes begin to show at the micropylar extremity of the ovum as two little red lines which grow plainer day by day. The embryonic stage lasts from 22 to 27 days, the greater number (over two thirds of the ova I bred) emerging on the twenty-fourth day.

#### FIRST NYMPHAL INSTAR.

Immediately after emerging from the ovum, the nymph is transparent, white and colorless, except that each abdominal segment has a broad dark luteous band at the connexivum. Also, the eyes are red and well-marked. The tarsal claws of the second and third pairs of pedes are dark and noticeable. The single claws of the first pair are colorless and transparent. The short rostrum is transparent pale lute-

ous, darker at the tip. A seta issues from the posterior angle of each abdominal segment, at the connexivum, on the dorsal surface. About eight hours after emergence the insect is much darker in color.

In shape the young *Pelocoris* resembles nothing so much as the suctorial midnight prowler, at a superficial glance. Carefully examined, however, it is seen to resemble closely the adult in shape, allowing for the difference in size and absence of wings.

When recently hatched its abdominal air coating is absent, and the young insect finds it difficult to reach the surface, which it succeeds in doing only by vigorous swimming. If it relaxes its efforts, it immediately sinks to the bottom. *Pelocoris* swims back down when in this condition.

When still uncolored, the dorsal vessel can be plainly seen pulsating and the oily globules of the unabsorbed yolk moving in the abdominal cavity. Size: Longitude, 2.5 mm.; latitude, 1.5 mm.

Out of a large number of individuals obtained from ova, only five reached the second instar, one in ten days after emergence, three in eight days and one in seven. This would give an average period of eight days for the first instar.

#### SECOND NYMPHAL INSTAR.

The appearance after the molt is practically the same as after emergence from the ovum, except that there is a dark, somewhat triangular shaped blotch extending from the caudad margin of the thorax to the fourth abdominal segment, apparently produced by the abdominal contents. The pulsations of the dorsal vessel can also be seen in this instar under the same conditions as before, save that the yolk is, of course, totally gone. Size: Longitude, 3.25 mm.; latitude, 2 mm.

Three alone survived till the second moult, two making the ecdysis in nine days and one in six. It may safely be assumed that the longer period is nearer the average, since the more rapid molt occurred in very hot weather.

#### THIRD NYMPHAL INSTAR.

The preceding description applies to this equally well. Size: Longitude, 4.8 mm.; latitude, 3 mm.

The succeeding observations have been made on the two survivors, which I safely carried through to maturity. However, I did not examine these at all closely for fear of losing them, so my notes on the

remaining instars are rather scanty. These two individuals molted for the third time eight days after the second ecdysis.

#### FOURTH NYMPHAL INSTAR.

Coloration and other peculiarities slightly more accentuated than in the preceding instars. Size: Longitude 6.5 mm.; latitude 4.2 mm.

I may here state that just previous to a molt, the insect is very thick through, especially so in this and the succeeding instars, and looks fit to burst out of its skin, as it does.

These two individuals were brought without accident to the fourth molt, one in ten and the other in twelve days. I am inclined to the belief that the former is more likely to be the average period.

#### FIFTH NYMPHAL INSTAR.

In this instar *Pelocoris* is much more opaque, though still whitish, immediately after the ecdysis. The wing pads appear in this instar. Size: Longitude, 8.3 mm.; latitude, 5.5 mm. The difference in size between this and the preceding instar is so great that, unless bred, one might be led to the belief that there was still another stage between the two.

The two insects arrived at the fifth and last moult in sixteen days, which taken in conjunction with the fact that an individual caught in this stage did not reach the adult condition till eleven days after capture, would seem to denote that it is practically the normal period.

I was fortunate enough to have the opportunity of observing the last moult in *Pelocoris*, which I will now describe from my notes taken during the process of the ecdysis.

The bug hangs from the surface, back up. The outer skin then splits along the thorax, and the scutellum of the emerging insect is seen. The opening enlarges as the insect gives rhythmical convulsive heaves. First the entire thorax comes out; then, with a jerk, the head. It now rests a moment and in a short space again takes up its motion, withdrawing the body little by little from the cast-off skin. The dorsum, as yet uncovered by the still unexpanded alæ and hemelytra, has a coat of air. The wings and hemelytra expand as the insect emerges, so that by the time it is entirely out they are fully developed, completely concealing the dorsum abdominis. It takes the insect about ten minutes to go through this final transformation. When it is entirely free, it turns quickly and hangs back down from the air-

filled and buoyant cast skin for a moment, until the wings are perfectly expanded. Then it begins to swim about quite rapidly, coming to rest once more, seemingly requiring something to 'hang to. There appears to be an undue amount of air under the insect's wings while it is in this condition, and it remains back up while swimming. The tracheal lining may be seen as *Pelocoris* emerges, connecting the sternum with the cast skin.

*Pelocoris*, immediately after the last ecdysis, is entirely of a beautiful light green like aquamarine, including the hemelytra and the limbs excepting the tibiæ, which are dark from the swimming hairs. The eyes are a dark ruby-red. The insect gradually grows darker, and about four hours after the change it is a mottled dark green. The full mature coloration is reached in about 12 hours.

*Pelocoris femorata*, therefore, as has been shown, has seven instars, namely: one embryonic, five nymphal and one adult. The embryonic stage lasts about 24 days; the first nymphal instar, about eight; the second, about nine; the third, about eight, the fourth, about twelve; and the fifth and last about 16 days. The adult overwinters and begins to breed in the spring, oviposition taking place earlier or later in the season, according to the temperature; and the life-cycle is completed about the beginning of July or later, governed by circumstances. The adult may, under favorable conditions, live for over a year, and oviposition seems to be continuous during the summer, giving a number of overlapping broods from overwintering adults.

The last conclusion is borne out by the fact that on the same day and at the same place, as previously stated, I have taken *Pelocoris* in the second to the fifth nymphal instars. The measurements of these in conjunction with those taken from my bred specimens, give ranges in size as follows, for the instars observed. All measurements are from the living or freshly killed insect.

2d Instar,	Long.,	3.25	mm.	(bred)	3.6	mm.	(wild).
	Lat.,	2	mm.	"	2.3	mm.	"
3d Instar,	Long.,	4.8	mm.	"	5	mm.	(wild).
	Lat.,	3	mm.	"	3.1	mm.	"
4th Instar,	Long.,	6.4	mm.	(wild)	6.5	mm.	(bred and wild).
	Lat.,	4	mm.	"	4.3	mm.	(wild).
5th Instar,	Long.,	7.9	mm.	"	9.2	mm.	" (8.3 mm. bred).
	Lat.,	5.1	mm.	"	6	mm.	" (5 mm. "
Adult,	Long.,	8.6-10	mm.	"			
	Lat.,	6-7	mm.	"			

In conclusion, I wish to say in extenuation of the many shortcomings and omissions in my endeavor to cast some light in obscure places, that in this work there are no guides. None have blazed a way which one may follow. And if I have erred, it is the school where the explorer learns, that later he or another may avoid the same pitfall.

## PROCEEDINGS OF THE NEW YORK ENTOMOLOGICAL SOCIETY.

### MEETING OF APRIL 7.

Held at the American Museum of Natural History, Tuesday evening, April 7, at 8 o'clock. The President and Secretary being absent the Vice-President, Mr. Leng, presided and Mr. Charles Myers was elected Secretary pro tem.

The following members were present: Messrs. Billings, Brues, Davis, Joutel, Leng, Myers, O'Connor, Palm, Southwick, Bueno, Watson, Weeks and two visitors, Miss Billings and Mr. Raymond Osborn. Reading of the minutes of the previous meeting was necessarily omitted.

Mr. Davis of the Field Committee reported that cards had been mailed to members calling for an outing to Fort Lee, Sunday, April 19.

Mr. O'Connor proposed Mr. Morgan Hebard, of Chestnut Hill, Philadelphia, as an active member of the Society.

A communication from the New Era Printing Company regarding the entry of the Journal as second class mail matter was referred to the Publication Committee. Also a communication was read from Mr. Schaeffer, referring to the fact that he would be out of the city for some time and Mr. Joutel was elected to fill the position of Librarian during Mr. Schaeffer's absence.

Mr. Davis then presented a few remarks on the subject of "A New Cricket (*Apithes agitator* Uhler) from the vicinity of New York."

He stated that this cricket was described in 1864 by Uhler who wrote of it as follows: "It inhabits grape vines and dense shrubbery near Baltimore and is found fully developed about the middle of September."

In the "Insects of New Jersey" it is recorded from Anglesea and Bay Side, both in Cape May County. In these localities it was found in September. In Scudder's Catalogue of the Orthoptera of the United States its habitat is given as "Southern U. S. east of the Great Plains." On the 21st of last September a single female of this species was found at Ward's Point, Tottenville, Staten Island, which is the most northern locality so far reported.

Mr. Joutel gave some notes on the "Food Habits of *Goes pulverulenta*." He stated that his experience in breeding this species showed the small value of negative evidence in that although he had always looked for the insect in beech, its recorded food plant, he had only found it in iron-wood (blue beech) and so thought there might have been an error in the determination of the food plant; since then, however, he has been informed by Mr. Laurent, of Philadelphia, that he had bred it from